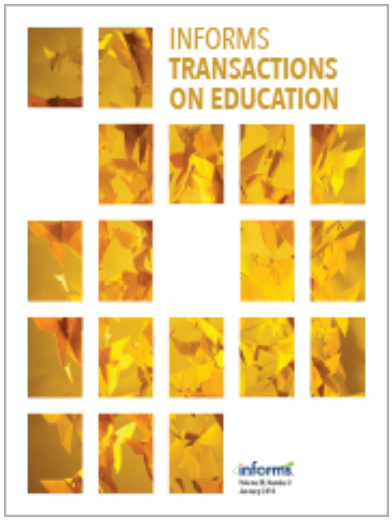

INFORMS Transactions on Education

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Case Article—Starting with Good Inputs: Unconstraining Demand Data in Revenue Management

Mark Ferguson, Carrie Queenan,

To cite this article:
Mark Ferguson, Carrie Queenan, (2009) Case Article—Starting with Good Inputs: Unconstraining Demand Data in Revenue Management. INFORMS Transactions on Education 9(3):180-181. https://doi.org/10.1287/ited.1090.0032ca

Vol. 9, No. 3, May 2009, pp. 180–181
ISSN 1532-0545 | 09 | 0903 | 0180
INFORMS Transactions on Education

informs
DOI 10.1287/ited.1090.0032ca

Case Article

Starting with Good Inputs: Unconstraining Demand Data in Revenue Management

Mark Ferguson
College of Management, Georgia Institute of Technology, Atlanta, Georgia 30332,
mark.ferguson@mgt.gatech.edu

Carrie Queenan
Mendoza College of Business, University of Notre Dame, Notre Dame, Indiana 46556,
c_queenan@nd.edu

Sales of goods and services are often limited by supply. This limitation restricts the knowledge of the true parameter values for the underlying demand distributions, values needed to calculate optimal protection levels in a revenue management system. We provide a teaching module and a case study to introduce students to the dangers of using "constrained demand." The teaching module illustrates the negative financial impact of failing to unconstrain demand data. The case study provides realistic constrained demand data that students can use to practice unconstraining methods, such as the commonly used averaging method. We have used these materials successfully in MBA and executive education classes on revenue management.

Key words: unconstraining; revenue management; demand estimation
History: Received: May 2008; accepted: December 2008. This paper was with the authors 3 months for 3 revisions.

We prepared the teaching module and the case study that accompany this article because we needed hands-on materials for teaching unconstraining methods in a revenue management (RM) course. Our materials can be used in RM courses in undergraduate, graduate, and executive education levels after a discussion of capacity allocation methods such as the newsvendor model (Littlewood's rule, Littlewood 2005) or the EMSR-b method (Belobaba 1989).

We recognized the importance and scarcity of unconstraining knowledge when a colleague practicing RM in the industry approached us with the question, "Are we sufficiently unconstraining our demand data?" He did not know whether his company was using the best method for unconstraining. Because of the potentially considerable impact on revenue, combined with the limited research on this subject (see Zeni 2001, Weatherford and Polt 2002, and Queenan et al. 2007 for relevant research on this topic), the firm was willing to share its data in exchange for our insights. The data in the case, while fictional, have patterns that are similar to the ones in the data from this firm.

We use the teaching module to illustrate the danger of using constrained demand data in RM. The case study (and its accompanying spreadsheet) provides an example of constrained demand data at a hotel. Students can unconstrain the data using a simple method that can be easily applied to this data set. As is the case with many hands-on exercises, the students in our classes have demonstrated a greater ability to explain the concept of unconstraining using our spreadsheet example versus the lecture format we used before developing the case and spreadsheet. Through positive course evaluation comments, we conclude that our students have appreciated our use of this learning tool in the classroom and walked away with a better understanding of what unconstraining is and how to do it.

The case has a narrow focus: to introduce students to unconstraining. We show them one unconstraining method: the averaging method. Quantitatively

advanced students may be asked to unconstrain data using other methods, such as expectation maximization or double exponential smoothing (Queenan et al. 2007) and to compare and contrast the accuracy of these methods.

We have used this case in both 75-minute MBA classes and 2- to 3-hour executive classes. For the MBA classes, prior to formally covering any material on unconstraining, we use the spreadsheet simulation in the "spiral down" teaching module, ExampleSpiralDownEffect-Figure.xlsx.[1] to demonstrate the danger of using constrained demand data in RM. Before the next class, we ask the students to read the case, and we provide a set of questions that lead the students through the application of the "averaging method" to the case data. We ask students to bring their laptops for the next class so we can go through the solutions. After working through the solutions, we discuss the advantages and disadvantages of the presented method and other possible methods. For classes with less quantitative skills, we have the students work through the case in class using their laptops, and we walk around during the class to offer assistance. Qualified instructors can access a Case Teaching Note,[2] which discusses different ways to use our materials and provides solutions.

References

Belobaba, P. P. 1989. Application of a probabilistic decision model to airline seat inventory control. *Oper. Res.* **37**(2) 183–197.

Littlewood, K. 2005. Forecasting and control of passenger bookings. *J. Revenue Pricing Management* **4** 111–123.

Queenan, C., M. Ferguson, J. Higbie, R. Kapoor. 2007. A comparison of unconstraining methods to improve revenue management systems. *Production Oper. Management* **16**(6) 729–746.

Weatherford, L. R., S. Polt. 2002. Better unconstraining of airline demand data in revenue management systems for improved forecast accuracy and greater revenues. *J. Revenue Pricing Management* **1**(3) 234–254.

Zeni, R. 2001. Improving Forecast Accuracy by Unconstraining Censored Demand Data. *Proc. 41st AGIFORS Sympos.*, Bangkok, Thailand.

Zeni, R., K. Lawrence. 2004. Unconstraining demand data at US Airways. I. Yeoman, U. McMahon-Beattie, eds. *Revenue Management and Pricing: Case Studies and Applications*. Thomson Learning, London, 124–136.

[1] This Excel spreadsheet file can be found and downloaded from http://ite.pubs.informs.org/.

[2] This PDF file can be found and downloaded from http://ite.pubs.informs.org/.